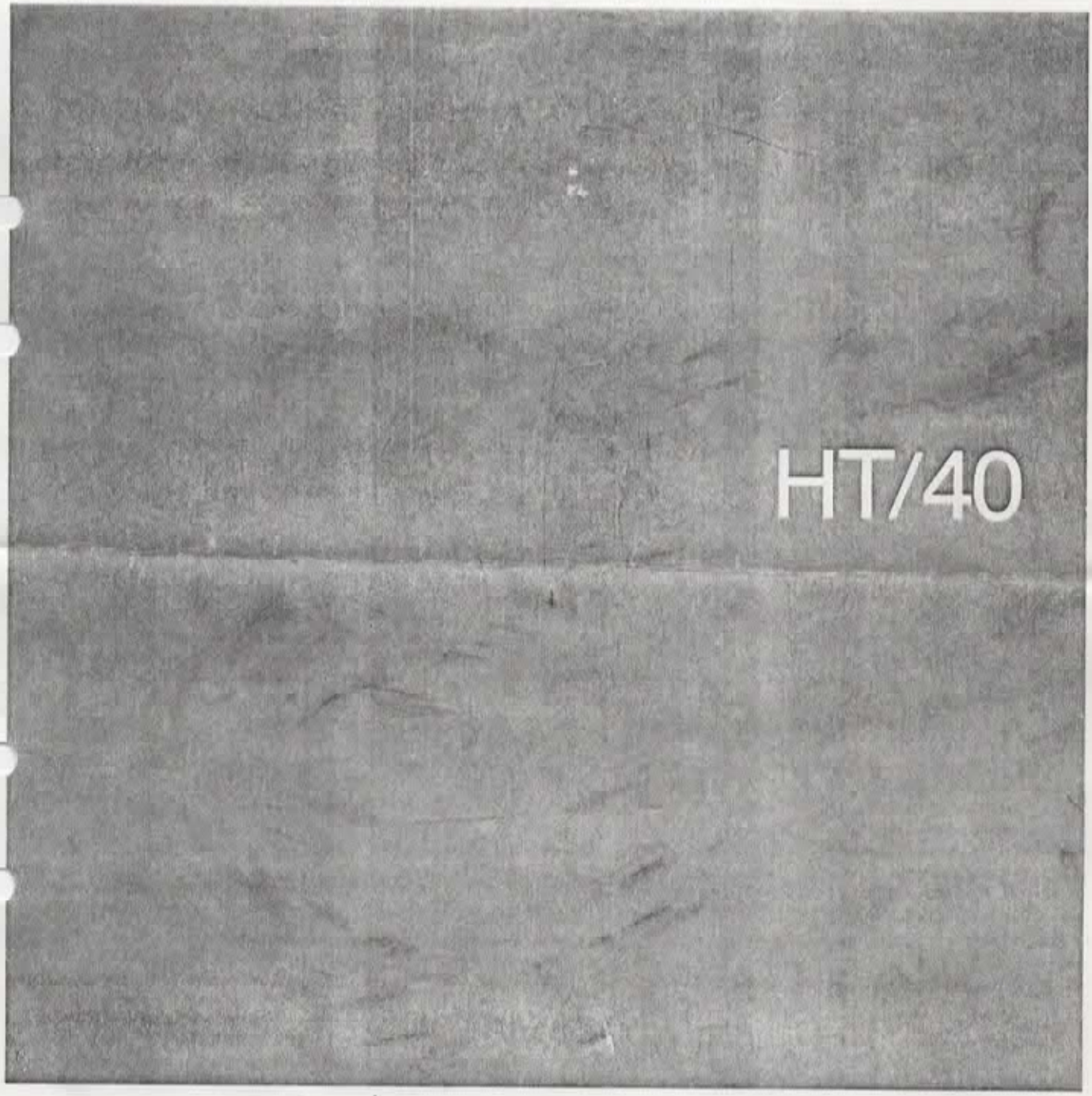
Termiflex



USER'S MANUAL

1 GENERAL OPERATION AND INSTALLATION

This chapter covers the power requirements, pinouts, and testing of the HT/40. This will provide the necessary information to power up the HT/40 and verify its operation. Also included is a description of the self-test which the unit runs each time the unit is turned on.

1.1 POWER REQUIREMENTS

The HT/40 operates on either a regulated +5 volt, dc supply or if ordered, it can optionally operate on up to +24 Vdc. In either case, should this voltage drop below the minimum 4.75 volts, operation of the terminal will be compromised. Symptoms of low voltage include the display no longer displays characters and the transmitter may not transmit.

1.1.1 5 Volt Operation

Voltage: 5 Vdc ± 5% (4.75 Vdc to 5.25 Vdc)

Current: Interface	Typical @ 5Vdc	With Backlighting
Simplified RS-232	12 mA	47 mA
RS-232-C	15 mA	50 mA
RS-422 (10K Termination)	22 mA	57 mA
20 mA Current Loop	13 mA	48 mA

Figure 1-1. *Power Consumption*

Keep in mind that a long run of cable between the unit and power supply will affect the voltage level at the terminal. For instance, a #22 AWG copper conductor of length 62 feet will have a 1 ohm resistance. If using long lengths of wire, the subsequent voltage drop must be considered when choosing cable. The following are typical values of resistance for various sizes of wires.

AWG	Ohms/100 ft.
22	1.02
24	1.61
26	2.57

Figure 1-2. *Wire Resistance*

1.1.2 Optional Wide Range Voltage Input

When ordered, this option allows the HT/40 to operate within the following range:

Voltage +4.75 Vdc to +24 Vdc

The typical current ratings listed in Figure 1-1 need to be increased when this option is installed. The ratings should be increased as follows:

Input Voltages +4.75 Vdc to +6.0 Vdc

Increase listed rating by: 30 mA

Input Voltage +6.0 Vdc to +24 Vdc

Increase listed rating by: 5 mA

The increase can be added to the listed rating since the current has been calculated based on the regulated +5 Vdc output of the internal dc/dc converter.

1.2 CIRCUIT RESET

When the HT/40 has power applied to it, a circuit reset must first take place before the unit becomes functional. The time required for this reset is approximately 3.5 seconds. The HT/40 will then enter the Self-Test mode which requires an additional 4 seconds. The unit will not transmit during this period and it will not display or respond to received characters. The display test part of the self test can be disabled, reducing the start-up time to 4.5 seconds.

1.3 SELF TEST

The HT/40 Self Test begins immediately after the hardware reset and verifies its integrity by means of 6 different tests. As it enters a different test, a message will appear on the display. If one of these messages remains on the display, then the unit failed during that test. If this occurs, the unit must be returned to the factory for service. The HT/40 tests the following features.

	MESSAGE
INTERRUPT — Internal CPU vectors and interrupts are tested. If failure occurs, then unit operations stop. No cursor will appear.	IRQ TEST
CPU — The flags and registers of the CPU are tested. If failure occurs, then unit operations stop. No cursor will appear.	CPU TEST
ROM — A checksum is done on all program memory locations. If failure occurs, then unit operations stop. No cursor will appear.	ROM TEST
RAM — The microprocessor RAM (192 bytes) is tested for failures. If failure occurs, then unit operation stops. No cursor will appear.	RAM TEST

RS-422 Units	
Description	**DB-25P Connections***
$\overline{\text{Xmit Data}}$	2
$\overline{\text{Recv Data}}$	3
Xmit Data	4
Recv Data	5
GND	7 — **Ground**
V_{IN}	9 — **+ V**

*For equivalent connections for other connectors, refer to Figure 1-3.

Figure 1-5. *RS-422 Off-line Test Connections.*

20 mA Current Loop Units	
Description	**DB-25P Connections**
(Loop Out)	2 — **20 mA Source**
(Loop In)	3
(Loop Out Return)	4
(Loop In Return)	5 — **20 mA Return**
GND	7 — **Ground**
V_{IN}	9 — **+ V**

*For equivalent connections for other connectors, refer to Figure 1-3.

Figure 1-6. *20 mA Current Loop Off-line Test Connections. Loop Out is transmit, Loop In is receive.*

If there is ever a question as to the correct operation of a unit, the off-line test procedure is a good way to verify that the unit is transmitting and receiving properly.

2.3 20 mA CURRENT LOOP

This interface type dates back to when teletype units were the only form of data terminal equipment available. It was principally designed to switch mechanical relays at a baud rate of 110. As systems became more refined and baud rates increased, other types of interfaces surfaced. The current loop, however, still remained popular for compatability reasons. The HT/40 is available with a 20mA passive current loop interface. This interface is considered passive because the current sources must be supplied externally, either by the data communications equipment (DCE or Modem), the host, or external supplies (e.g. Termiflex Model #PS/1A).

The Termiflex units are constructed with independent transmit and receive circuitry. This allows the system to be configured as a two or four wire loop. Typical voltage drops and simplified schematics of the transmit and receive circuits are shown in FIGS. 2-2 and 2-3. Optical isolation is provided in both circuits to minimize noise problems, and to permit voltages of up to 150v to drive current loops. Some typical two and four wire loop systems are shown in FIGS. 2-4 through 2-7.

For current loop systems, a mark or idle state is indicted by current flow. A space or break state is indicated by no current flow in the loop. Because of this convention an unpowered HT/40 in the loop, or a break in the loop, such as a disconnected unit, indicates a space or break condition.

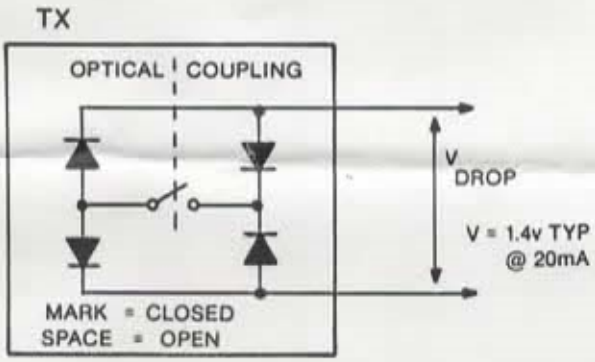


Figure 2-2. *Simplified schematic and D.C. parameters of 20mA Transmit Circuit.*

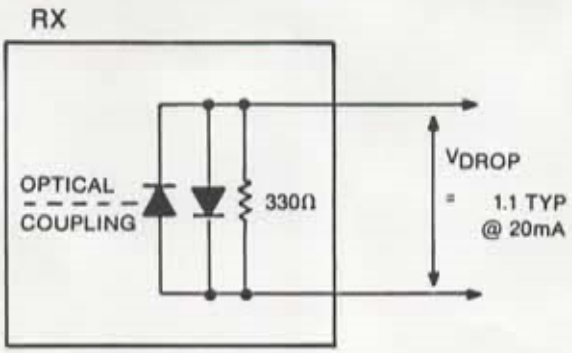


Figure 2-3. *Simplified schematic and D.C. parameters of 20mA Receive Circuit.*

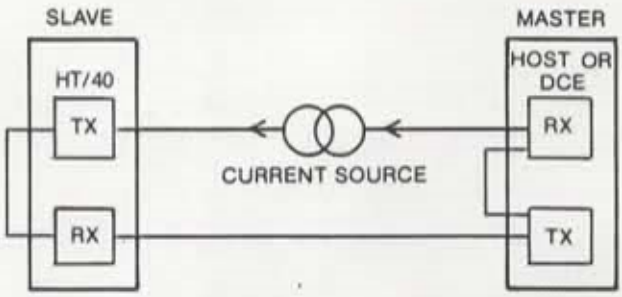


Figure 2-4. *2 Wire Loop System with 1 remote TFX Unit. (Only one unit may transmit at a time. Both units receive transmitted data.)*

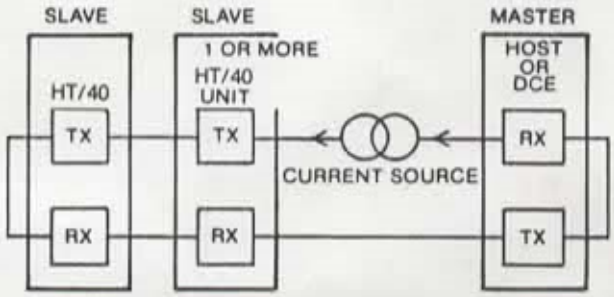


Figure 2-5 *2 Wire Loop System with 2 or more remote TFX Units. (Only one unit may transmit at a time. All units receive transmitted data.)*

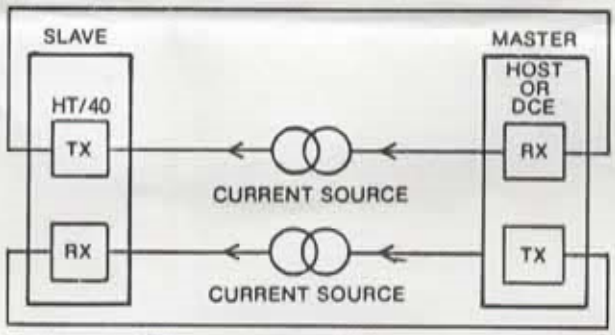


Figure 2-6 *Four Wire Loop System with 1 remote TFX Unit. (Both units may transmit simultaneously.)*

3 KEYBOARD

This chapter covers both the operation of the keyboard and the preparation of custom keyboard graphics. There are two transmission modes that the user can select for the HT/40. Because of this, we provide overlays which allow the user to have the appropriate legends for the particular transmission mode. These two modes are the Simplified Keyboard and Full ASCII keyboard.

3.1 SIMPLIFIED KEYBOARD — 24 ASCII CHARACTER TRANSMISSION.

In this mode, set by using the downline commands specified on page 13, the keyboard will transmit one character per key, 24 total. There is a default set of characters for the Simplified Keyboard and there is a user select mode which allows a different, user specified, group of characters to be transmitted.

3.1.1 DEFAULT KEYBOARDS

Figure 3-1 shows the legends, in bold, for the default simplified keyboard. In parenthesis below each is the ASCII code in hexidecimal. Please note that you have an overlay for the keyboard which matches this configuration. Each time a key is pressed, a character is transmitted. Auto Key Repeat and Maximum Key Repeat can be enabled for this mode and apply to all the keys. Please refer to section 3.3 for detailed information on the Repeat functions.

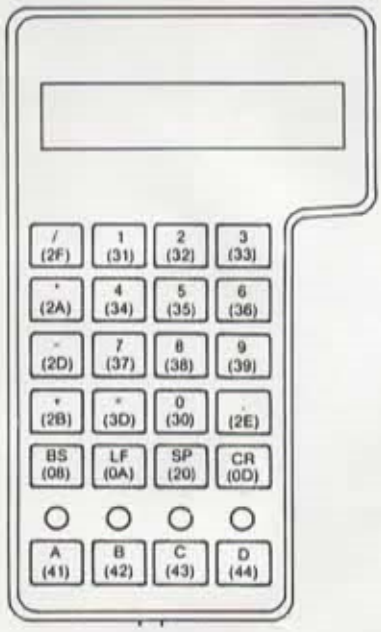


Figure 3-1. *Simplified Keyboard Default Codes Hex codes in ( ).*

3.1.2 USER SELECTED KEYCODES.

The user may optionally set the character to be transmitted by each key for the Simplified Keyboard mode. This is done by using the commands specified on page 14 for downline loading. All the characters will be ASCII codes and may be any of the 128 character set. The Auto Key Repeat or Maximum Key Repeat may be enabled but is done on a key by key basis at the same time that the code is chosen. If neither is enabled for a specific key, then that key will transmit one character per keystroke. Please refer to section 3.3 for more information on the Repeat functions.

3.2 FULL ASCII KEYBOARD — 128 ASCII CHARACTER TRANSMISSION

In this mode, 19 of the 24 keys will transmit an ASCII character. The remaining 5 keys are used to modify the transmission of the keys to allow generation of the entire 128 character set. The key legends are shown in Figure 3-2 for this configuration. The four bottom keys are shift keys and operate as described in the following section. The key marked CTRL is the control key and lower case key. This is described in section 3.2.2.

3.2.1 SHIFT KEYS

The bottom row of keys in Figure 3-2 are shift keys which modify the 19 transmitting keys. The shift key also affects the shape of the cursor as shown in Figure 3.3. The Normal Cursor, for instance, corresponds with the unshifted mode. The unshifted mode is the initial condition at power up and can be obtained at any time by pressing the left most shift key, the shift cancel. Any time a shift key (left, middle or right) is used it will remain active for one following keystroke, after which the keyboard will revert back to the unshifted mode. The left shift key, second key from the left, will access characters such as A, D, etc. when the user presses the left shift followed by the A key. The middle and right shift key operate in a similar fashion.

3.2.2 CTRL, CASE, LK, UNLK

This key, in conjunction with the shift keys allows access to all control characters and lower case characters. To generate a control character with the unit in the unshifted mode, the user would press CTRL followed by a shift key followed by the appropriate keyboard legend key. For example:

CONTROL LEFT SHIFT G

3.5 CUSTOM OVERLAYS — KB/500

Termiflex can manufacture special multicolor overlays for you and ship the units with this overlay already on the case. There is a limit of 5 colors for a keyboard.

To generate the artwork, Termiflex will send to you, a 2X master form for you to put your art on. This can consist of legends and logos located anywhere within the tolerances specified on the instruction sheet that will come with the form. All colors specified must be called out as a PMS number.

Control Code (Hex)			Response
Carriage Return	CR	(0D)	Cursor returns to left-most position
Line Feed	LF	(0A)	Information scrolls up one line when next displayable character is received. If cursor is in top line, it moves to the bottom row, leftmost position in current line.
Backspace	BS	(08)	Cursor moves back one position in current line.
Enquiry	ENQ	(05)	Unit responds with an ACK (Hex 06)
Substitute	SUB	(1A)	Starts a flashing sequence.
Cancel	CAN	(18)	Terminates a flashing sequence.
Escape	ESC	(1B)	Prepares terminal for a following command
File Separator	FS	(1C)	Displays #1 user defined character
Group Separator	GS	(1D)	Displays #2 user defined character
Record Separator	RS	(1E)	Displays #3 user defined character
Unit Separator	US	(1F)	Displays #4 user defined character

Figure 4-2. *HT/40 Response to Valid Control Characters*

4.2 BACKLIGHTING OPTION

The HT/40 is available with a backlight option. If you purchased this option, your unit will draw approximately 35 mA more current at 5Vdc. Typical values of current are shown in figure 1-1.

ESC (Hex 1B)	Q (Hex 51)	Backlight ON
ESC (Hex 1B)	R (Hex 52)	Backlight OFF

There is no control over the intensity of the backlight.

4.3 CURSOR MOVEMENT AND DISPLAY COMMANDS

The list of ESCAPE commands specified in figure 4-3 gives all the controls for movement of the cursor and screen erasing. Definitions of the commands are as follows.

Cursor Up — Moves the cursor up one row. No change in horizontal position. When the cursor is in the top row of the display the command is ignored.

Cursor Down — Moves the cursor down one row. No change in horizontal position. When the cursor is in the bottom row, the command is ignored.

Cursor Right — Moves the cursor to the right one position. Vertical position is unchanged. When at far right, the command is ignored.

Cursor Left — Moves the cursor to the left one position. Vertical position is unchanged. When at the far left, the command is ignored.

Cursor Home — Places the cursor in the bottom row, left most character position.

Cursor Home Up — Places the cursor in the top line, left most character position.

Erase to End Of Line — Erase all characters from the cursor position to the end of the line. Cursor position is unchanged.

Erase to End Of Screen — Erase all characters from the cursor position to the end of the display. Cursor position is unchanged.

Direct Cursor Positioning — Moves the cursor to a specific location on the display.

Code Sequence		Function
ESC (1B)	A (41)	Cursor Up
ESC (1B)	B (42)	Cursor Down
ESC (1B)	C (43)	Cursor Right
ESC (1B)	D (44)	Cursor Left
ESC (1B)	H (48)	Cursor Home
ESC (1B)	L (4C)	Cursor Home Up
ESC (1B)	K (4B)	Erase to End of Line
ESC (1B)	J (4A)	Erase to End of Screen
ESC (1B)	Y (row) (column) (59)	Direct Cursor Positioning row = (Hex 20) Sp for Row 1, (Hex 21) ! for row 2 column = (Hex 20) Sp to (Hex 2F)/ Row 1 to Row 16 respectively
ESC (1B)	M (4D)	Display Message Buffer
ESC (1B)	N (4E)	Restore Message Buffer
ESC (1B)	Q (51)	Backlight ON
ESC (1B)	R (52)	Backlight OFF
ESC (1B)	E (parameter) (45)	Define User Characters (refer to page 14)
ESC (1B)	F (message) (46)	Define Message Buffer (refer to page 14)
ESC (1B)	G (parameters) (47)	Define Operation Parameters (refer to page 13)
ESC (1B)	I (keycodes) (49)	Define Keyboard Configuration (refer to page 14)

Figure 4-3. *ESCAPE commands.*

5 TERMINAL SET-UP

The HT/40 has the ability to retain a user selected configuration even when power to the unit has been interrupted. The selections that can be made must all be done through the serial data line. These selections include configuring

Communications Parameters
Keyboard Parameters
User Defined Characters
User Defined Keycodes and
Display Parameters

These configuration options are detailed in the following sections.

NOTE: Be sure to read section 5.4 on writing to non-volatile memory.

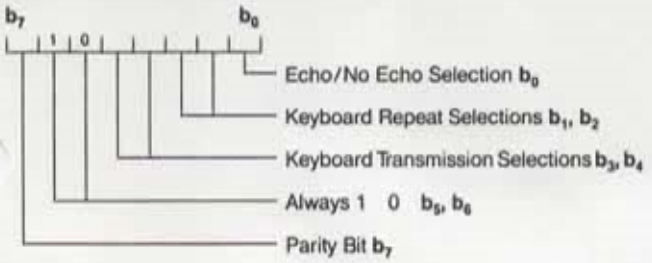
5.1 KEYBOARD, COMMUNICATIONS, AND DISPLAY PARAMETERS

The following escape command, transmitted to the HT/40 will set up the following parameters.

ESC G (Keyboard Byte) (Communications Byte) (Display Byte)

where each of the three variables is a bit mapped byte defining terminal characteristics.

5.1.1 KEYBOARD BYTE



Echo/No Echo	b_0
Echo =	1
No Echo =	0

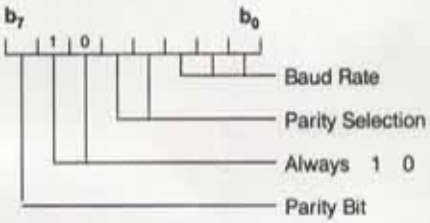
Keyboard Repeat Selections	b_2	b_1	
No Repeat =	0	0	
Auto Repeat =	0	1	
Max Repeat =	1	X	(X = Don't Care)

Keyboard Transmission Selections	b_3	b_4
Shift Enabled	0	0
Shift Disabled, Default Keycodes	0	1
User Defined Keycodes	1	X
	(X = Don't Care)	

Default Keyboard Settings: No Echo, No Repeat, Shift Enabled

NOTE: The high order bit (b_7) is the parity for the byte to be transmitted and is not part of the user selections and must agree with the current parity setting.

5.1.2 COMMUNICATIONS BYTE



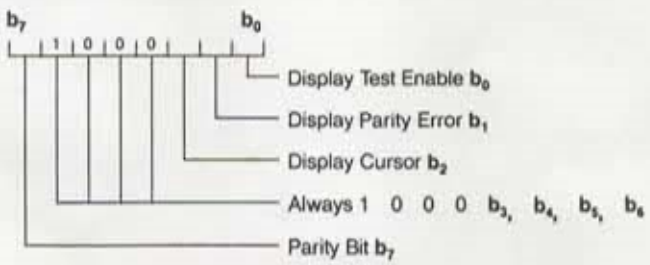
Baud Rate	b_2	b_1	b_0
110	0	0	0
150	0	0	1
300	0	1	0
600	0	1	1
1200	1	0	0
2400	1	0	1
4800	1	1	0
9600	1	1	1

Parity	b_4	b_3	
EVEN	0	0	
ODD	0	1	
MARK	1	0	Also called 8 bit No Parity
SPACE	1	1	Also called 7 bit No Parity

Default Communication Settings are: 1200 Baud, EVEN PARITY

NOTE: The high order bit (b_7) is the parity for the byte to be transmitted and is not part of the user selections and must agree with the current parity setting.

5.1.3 DISPLAY BYTE



Display Test Enable	b_0
Enable	1
Disable	0

6 MECHANICAL AND ENVIRONMENTAL

This chapter gives the physical information for both the HT/40 and its accessories. The drawings in this chapter involve the mounting of the HT/40, using the brackets available from Termiflex. If other information is required, please contact the factory.

6.1 SPECIFICATIONS

Maximum Dimensions	7.1" high x 4.2" wide x 1.5" deep
Weight	15 oz (426g)
Operating Temperature Range	-18°C to +50°C
Storage Temperature Range	-20°C to +70°C
Humidity	95% non-condensing

6.2 MOUNTING

There are two methods of mounting the HT/40. The first is to hang the unit such that it can be removed and operated in the hand. The second is to panel mount the unit. Figures 6-1 through 6-4 give dimensions of the HT/40 case, brackets, and cutouts necessary to mount the terminal using either method.

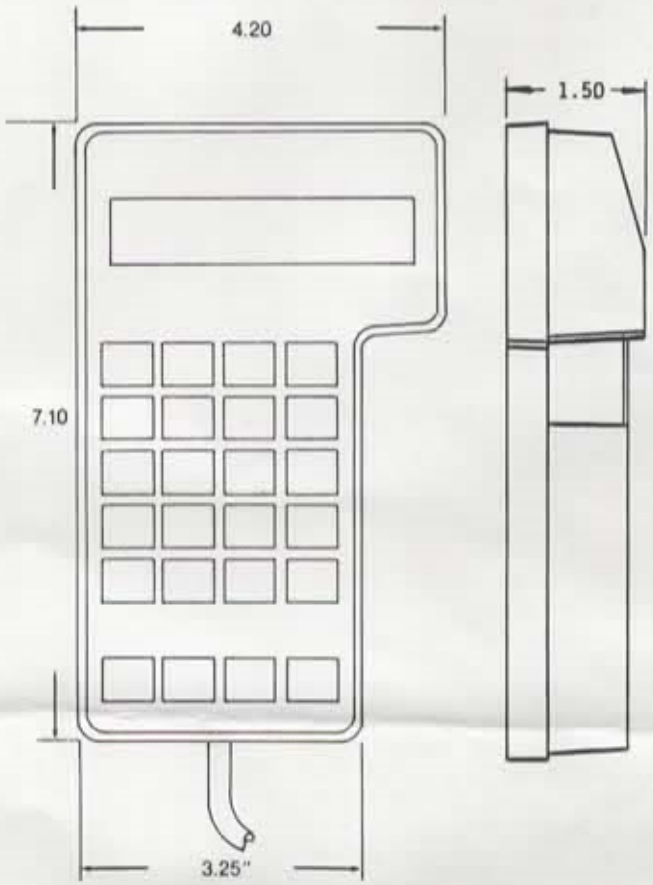


Figure 6-1. *HT/40 Outline Drawing. (All Dimensions are in Inches)*